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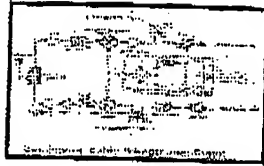


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BACKGROUND INFO

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• The reason of introduction of Cellular Technology

- At first, it was used for automobile telephone at the department of Detroit Police in 1921.
- Improvement for the quality of telecommunication and overcoming for the quantity of telecommunication at the same frequency.

• Improvement of mobile communication

	Frequency	Driving System	Systems
The first generation	900MHz	Analog	AMPS, NMT, TACS
The second generation	900MHz	Digital	D-AMPS, GSM, PDC
2.5 generation	1.8~1.9GHz	Digital	PCN, PHP, PCS
The third generation	Above 2.2GHz	Digital	IMT-2000
The forth generation	~	Digital	Wireless, Mobile Broadband

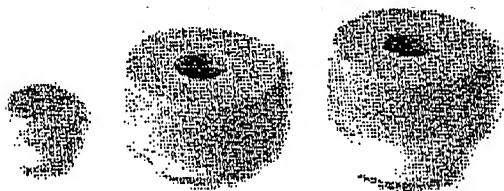
• The reason of the using Microwave Dielectrics

<ul style="list-style-type: none"> - Extreme enlargement of Intelligent Technology - R&D of the broad region communication at the high frequency - Development of personal telecommunication machine - Integration of semiconductor at the high frequency - Miniaturize of element, Demanding of temperature equilibrium - Invar resonator (Cu alloy) 	
Characteristics	
<ul style="list-style-type: none"> - The using at 300MHz ~ 100 GHz - Big and heavy - Impossibility of Miniaturize 	
SAW filter (Surface Acoustic Wave)	<ul style="list-style-type: none"> - Possibility of Miniaturize - Low frequency - Needs low power of driving - Impossible to use at high frequency - Limit of lithographic technology
Dielectric ceramics	<ul style="list-style-type: none"> - Realization of miniaturize for passive elements - Needs high power of driving - Temperature equilibrium of frequency - High dielectric constants, low dielectric loss

- | |
|--|
| <ul style="list-style-type: none"> - High dielectric constants, low dielectric loss - Possible to use at microwave frequency |
|--|

● Dielectric resonator

- Using resonating characteristic of dielectric ceramics, the resonator that can display resonating characteristic at the same frequency.

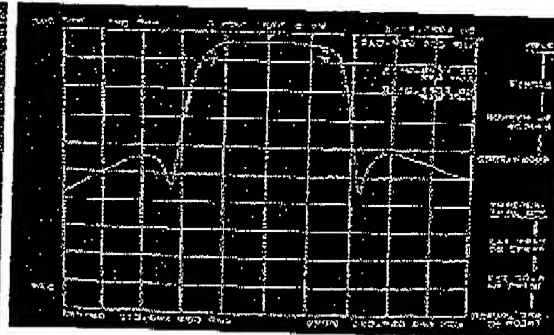
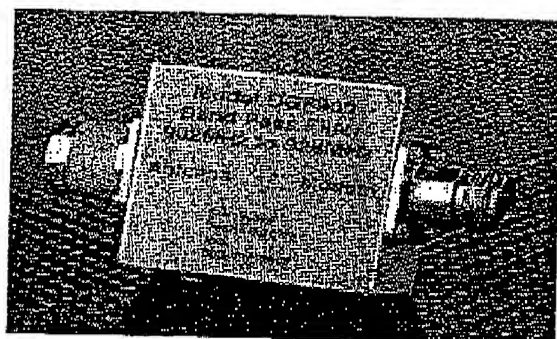


● Development tendency of dielectric resonator

LC resonator	Using LC which is integrated device
	Merit of size
	Bad resonating characteristic
	Broad using at the VCO
Dielectric resonator	Using two types as TEM and TE
	High resonating characteristic
	Demerit of size
	Using as high frequency resonator
	Small and light by the tape casting
Piezoelectric resonator	The resonator composing using piezoelectric
	(Tape casting, F-BAR)
	Merit of size and characteristic

SAW resonator	Possible to use to VCO and filter
	Expectation of demand increasing
	Forming using the characteristics of the SAW
	Expectation of demand increasing
	Demerit of small driving power
	Can use under 2GHz

● Band-Pass Filter

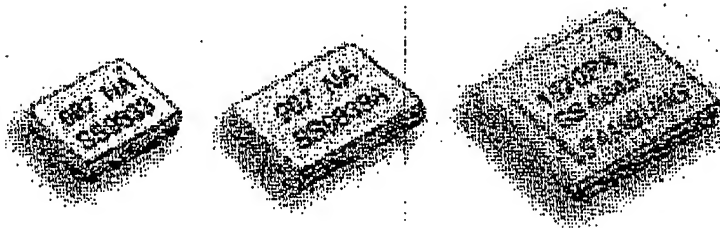


- Its loss is small because it uses $\lambda/4$, which is the frequency of TEM(transverse electro-magnetic mode), and band width is broad. It has a few advantages such as superior diminution, temperature equilibrium, and anti-shock of inner vibration.
- Needs to investigate microwave dielectric materials above 100 dielectric constant in order to miniaturize and lighten
- Coupling mode producing by using the coupling of capacity and the inductivity made by attaching capacitor and coil to several square resonator.
- mono type producing by plating surface with Cu and Ag by forming the hole, which is for inner conduct of a live spindle line, at the dielectric blocks, and also, by forming capacitor for input and output to the surface.

● The way of improving Band-Pass Filter

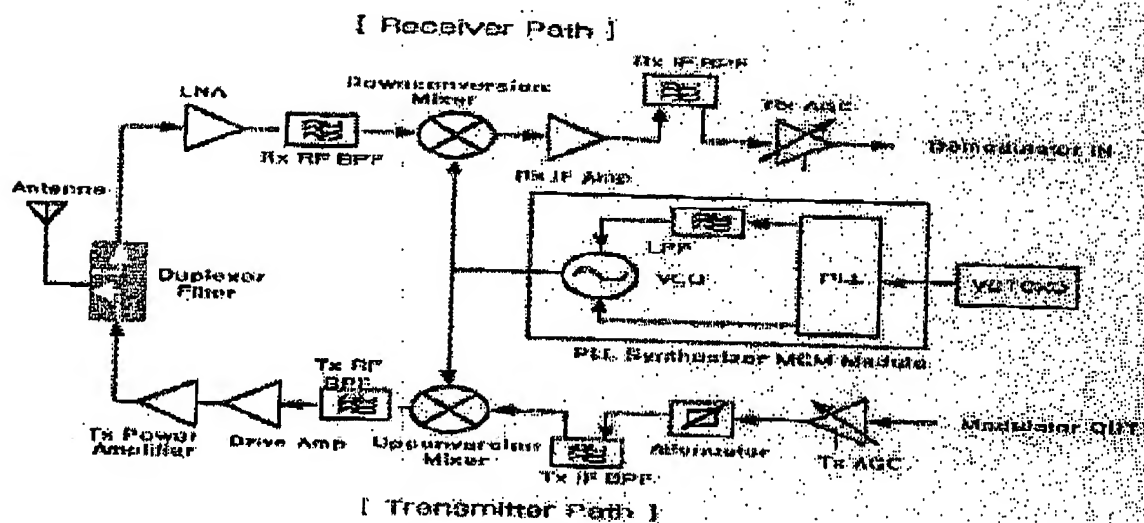
- ☛ The aim is elimination of Spurious Wave which is occurred at the Duplexer and LAN
- ☛ Like Duplexer, dielectric filter alternates to SAW filter
- ☛ SAW filter is better than dielectric filter at the size, characteristic of filtering, driving power. On the other hand, SAW filter has the impossibility to be singlecrystallized with other parts
- ☛ By these problems, BAW which can be chipped with parts of active device is being investigated
- ☛ From now on, in order to introduce IMT-2000, the broad area and the low loss filter is being investigated
- ☛ SAW filter can be alternated to the ceramics or the piezoelectric materials

● Voltage Controlled Oscillator



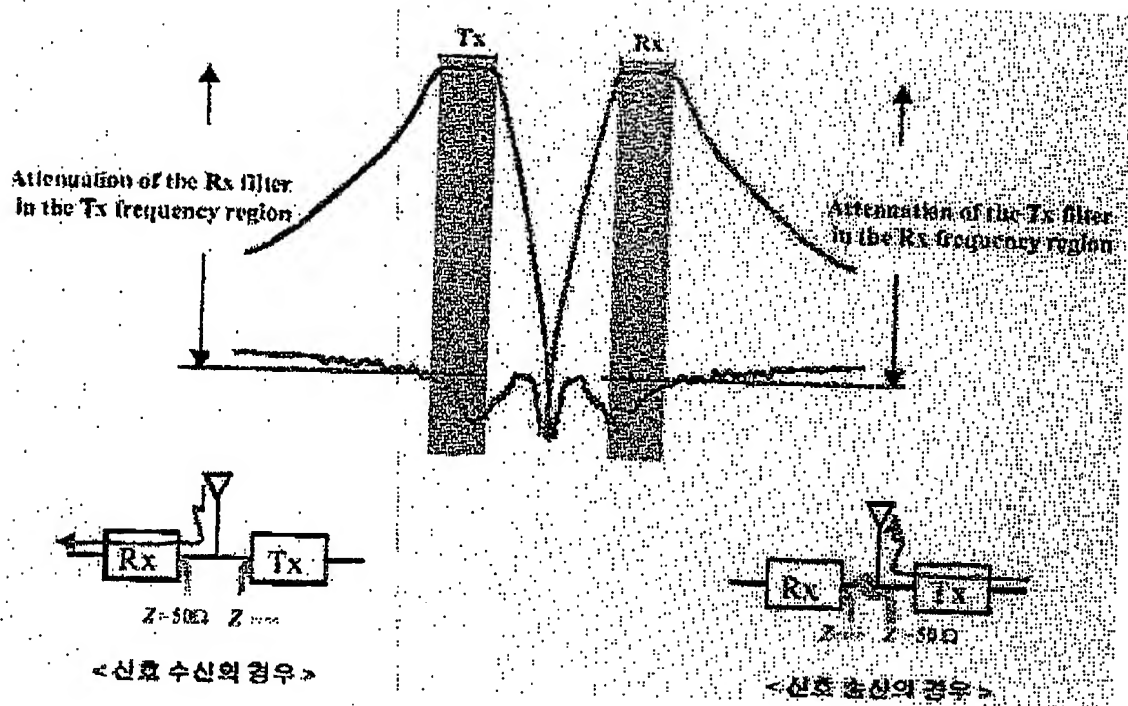
- ☛ VCO is the oscillator of frequency, VCO controls wireless frequency which originates during transmitting and receiving by input voltage
- ☛ Technical problems : compactness, excellent low power consumption, and stability of frequency
- ☛ Electrical property : stability of output, stability of high frequency, and decreasing of noise
- ☛ There are single, dual, high-power type of GSM, and triple types
- ☛ Equiaxial type : Stripline-resonator (Lamination technique)

• The location of Duplexer

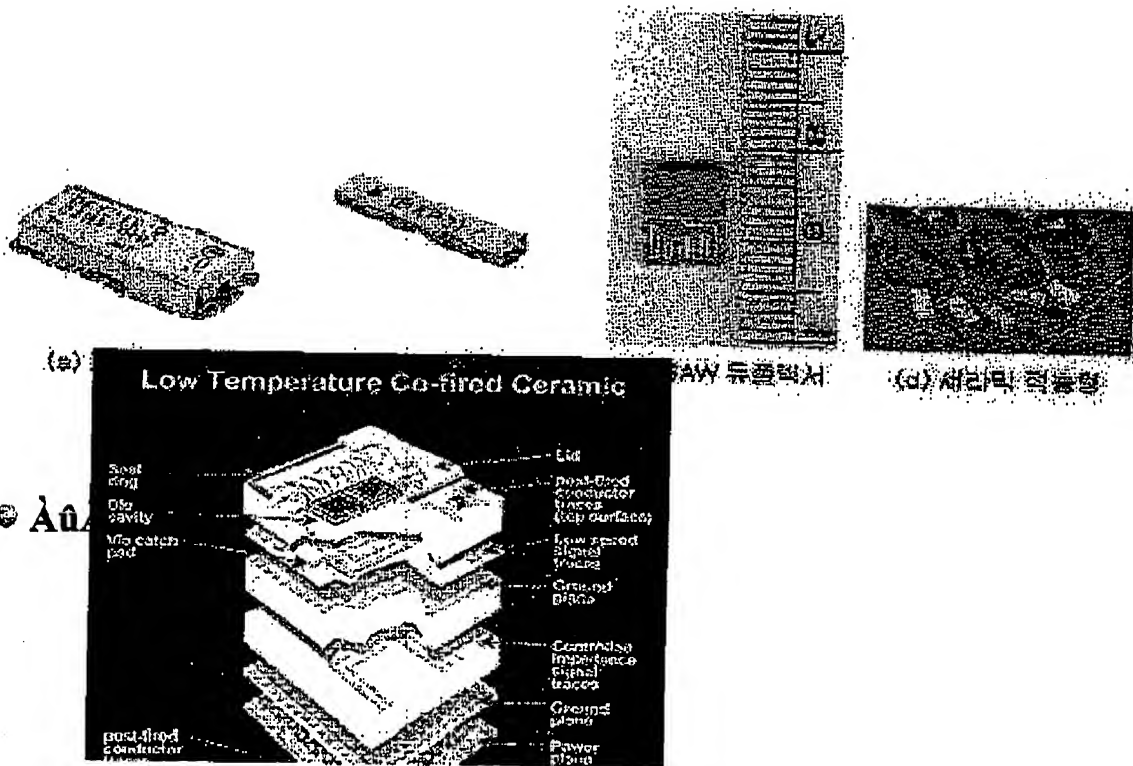


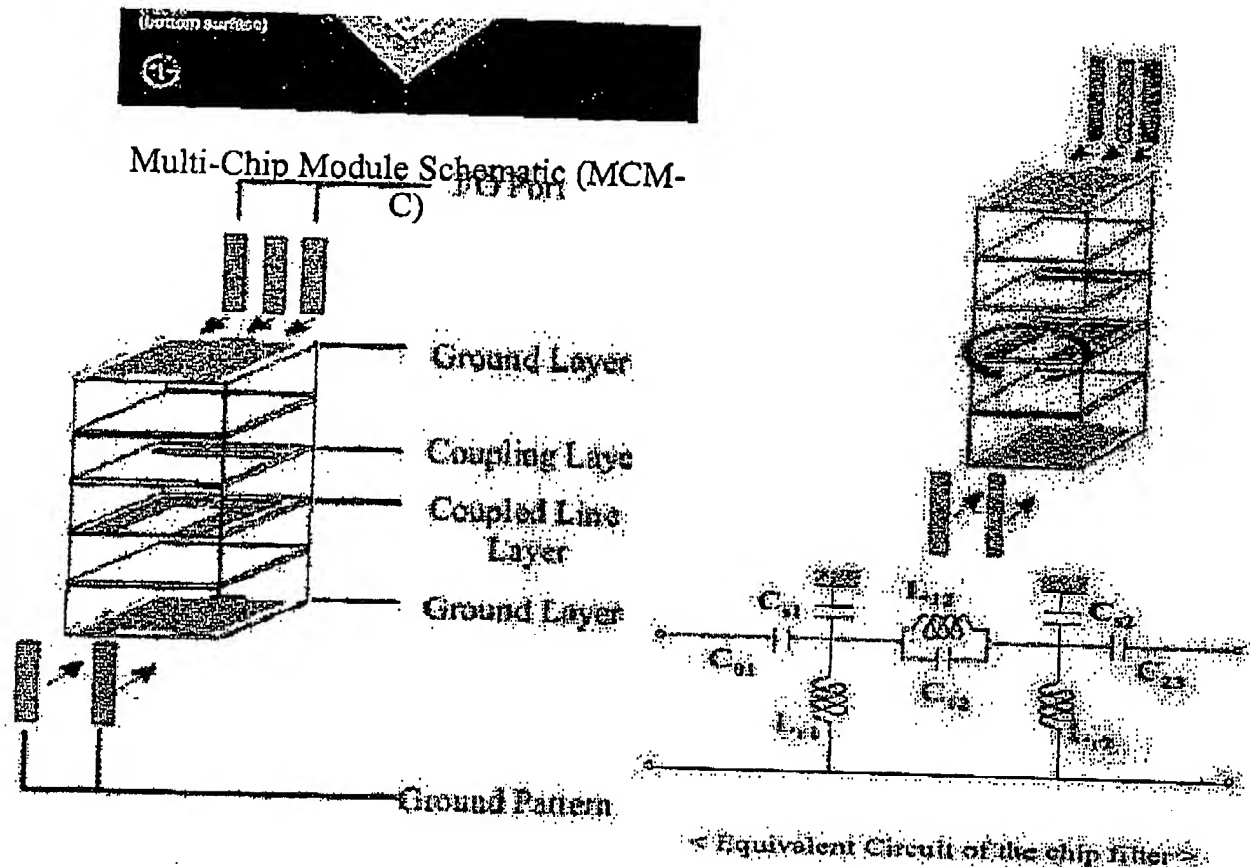
Block Diagram of the Mobile Telecommunication Terminal

• The frequency characteristic of Duplexer

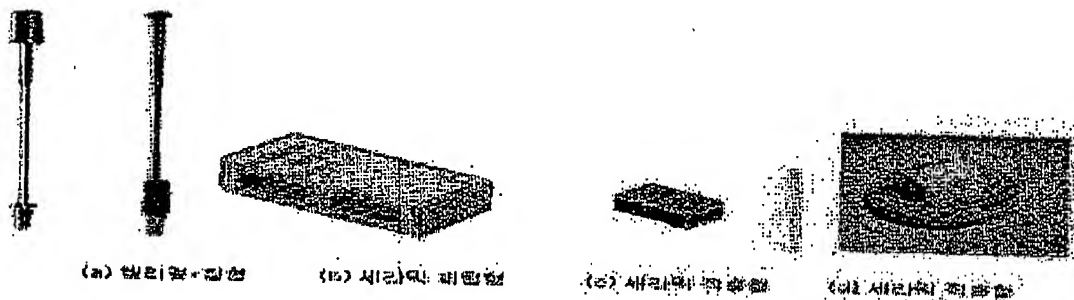


● $\mu\text{A}\tilde{\text{A}}^{\cdot 01/4}$ (Duplexer)ÀÇ ÇüÄÄ





● Antenna



- Antenna changes electric signals or electromagnetic waves. (input and output)
- Characteristic: $\pm 1/4\lambda$, $\pm 1/2\lambda$, efficiency as driving ($\pm 1/4\lambda$) of low $\pm 1/4\lambda$, advantages through antenna $\pm 1/4\lambda$, and portable easiness through smallizing.
- Development tendency: according to multimedia and $\pm 1/4\lambda$, and aim to $\pm 1/4\lambda$ frequency, $\pm 1/4\lambda$ used multi layer system, small antenna for dual, and antenna development of $\pm 1/4\lambda$ and $\pm 1/2\lambda$.
- LTCC: $\pm 1/4\lambda$ of existing $\pm 1/4\lambda$ antenna is formed above several ceramics

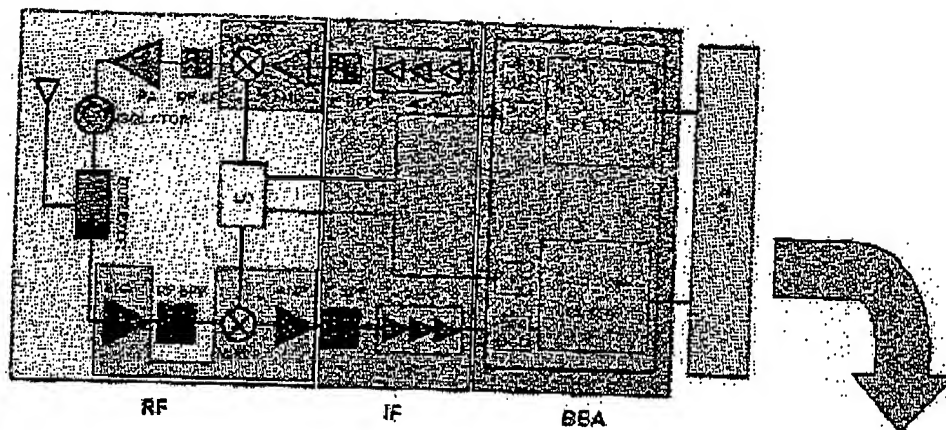
patterns, and multi layer system is used for micro , μ âÈ.

• Multi-Chip Module & LTCC

⇒ MCM(Multichip Module)

- MCM can be possible to be high-speed, miniaturization, and low price by reducing LSI
»óÈf'è¼±±æÀĬ which lays lots of devices on same substrate

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